Operating Experience Weekly Summary 97-32

August 1 through August 7, 1997

Table of Contents

Visit Our Web Site

The Weekly Summary is available, with word search capability, via the Internet at **http://tis.eh.doe.gov/web/oeaf/oe_weekly/oe_weekly.html**.
If you have difficulty accessing the Weekly Summary at this URL, please contact the ES&H Info Center, 1-800-473-4375 for assistance.

EVENTS

1. CRITICALITY SAFETY INFRACTION AT LAWRENCE LIVERMORE NATIONAL LABORATORY

On July 15, 1997, personnel at the Lawrence Livermore National Laboratory reported a criticality safety infraction when they discovered three small plutonium components in a large L-shaped glovebox that also contained two larger plutonium pieces. The infraction occurred because the three small pieces had not been incorporated into the criticality safety analysis for the glovebox and the combination of five pieces was not permitted. When the material handler realized that an infraction had occurred, he stopped work. He then evacuated the room and notified facility management. Facility management and members of the Criticality Safety Group assessed the situation and developed a recovery plan. They determined the margin of subcriticality was acceptable because of (1) the geometry of the components, (2) the relatively small fissile masses, (3) the lack of neutronic interaction between the various components, and (4) the absence of hydrogenous reflector/moderator materials within the glovebox. Double contingency remained throughout the event because controls prohibited the introduction of moderators and the required separation of the components was maintained. (ORPS Report SAN--LLNL-LLNL-1997-0041)

Facility criticality safety engineers reported that two modes of operation exist for the glovebox: a “generic condition” and a “defined condition.” The two modes are mutually exclusive, and only one may be in effect at a time. The generic condition relies primarily on mass control to ensure criticality safety. There are no restrictions on shape or number of components. When the glovebox is operated in the defined condition, procedure-specific criticality safety limits are in effect. The Criticality Safety Group has performed criticality safety evaluations for a variety of “permitted” defined conditions. They formalized the criticality safety limits for these conditions in a safety procedure and posted them on the glovebox.

On the day of the infraction the glovebox was operating in a defined-condition mode. The criticality safety limit for the defined condition was included in a table in the safety procedure. The table also includes information on the allowed masses and parts for all of the other “evaluated” defined conditions. Criticality subject matter experts determined that a paragraph in the procedure states that the mass limit for the operation applies only if ALL fissionable material in the glovebox conforms to the limits for the defined condition. This paragraph was not posted on the glovebox.

While inspecting the glovebox, facility personnel observed that the two larger pieces of plutonium had metallic outer shells. Because of the possibility that an outer shell could act as a neutron reflector, criticality safety controls require the shell to be treated as if it were plutonium for mass calculations. This approach is considered to be very conservative and provides a level of assurance for criticality safety. When the masses of the shell and plutonium were combined, criticality safety engineers determined that an over-mass condition existed in the glovebox.

Facility management placed the building in standby, walked down all the other gloveboxes in the building to determine if any similar conditions existed, and established an independent investigation team. After the Criticality Safety Group assessed the situation, they decided to remove one of the larger pieces of plutonium to reduce the mass of plutonium in the glovebox and bring it into compliance with the generic condition limits. As part of their recovery plan, they verified the configuration of the fissile material in the glovebox. They also determined that a paragraph in the safety procedure requires a separate, specific criticality safety evaluation when the metallic outer shell exceeds a certain thickness. When the cladding thickness is less than thickness prescribed in the procedure, the tabular mass limits of the safety procedure can be used, if the cladding mass is treated as plutonium mass for determining compliance with the

criticality safety limits.

Facility personnel continue to investigate this event. They have not established final corrective actions or determined the root cause. Based upon a review of this event and other criticality safety infraction occurrence reports, criticality safety subject matter experts believe absence of formal procedures for transition between operating conditions for gloveboxes, inconsistent use of postings and procedures, the possibility that material handlers may be confused by the use of OR and IF/THEN logic on glovebox postings, and inadequate pre-evolution planning could be contributing causes for this event. Subject matter experts also believe these issues are indicative of operational and programmatic weaknesses, including the following.

- All of the criticality safety controls existed in the safety procedure. However, they were not specific to the planned operation, and only a portion of the control guidance (the table) was transferred to the posting. A material handler could be misled into assuming that all of the controls existed in the posting when, in fact, important guiding paragraphs from the procedure were not posted.

- The criticality safety guidance contained in the safety procedure appears to provide flexibility for operations, which is desirable. However, it also appears that the material handler performing the movement or operation has the burden of interpreting the guidance provided in multiple instruction sets; possibly while he is trying to accomplish the task.

- A material handler placed fissile material in the glovebox, which was not permitted under the existing criticality safety limits. A formal protocol or checklist supporting the transition between operating modes for the glovebox may have been helpful to the material handler. Investigators reported that an accurate materials balance card, correctly listing the parts and the proper weights, was posted at the glovebox. A pre-evolution inspection of the material balance sheet by an individual cognizant of the pertinent criticality safety limits might have prevented this infraction.

Some DOE sites (Los Alamos National Laboratory, Savannah River Site, and the Rocky Flats Environmental Technology Site) have implemented the use of a criticality safety officer/representative who works directly for Operations Department supervisors. These individuals bring a criticality safety focus to work planning and execution. They can also evaluate planned operations and extract the necessary specific criticality safety controls from the flexible guidance provided by the criticality safety organization. The information they extract can then be presented to operators or materials handlers as clear, complete postings specific to the operation being performed, without the use of potentially confusing OR and IF/THEN logical conditions.

ANSI/ANS-8.19-1984, *Administrative Practices for Nuclear Criticality Safety,* provides the criteria for administration of an effective nuclear criticality safety program for operations outside of reactors in which there exists a potential for criticality accidents. The information in several sections of the standard can be related directly to this event. Sections 4, 5, and 6 address responsibilities for managers, supervisors, and members of the nuclear criticality safety staff. Section 7, “Operating Procedures,” provides information about the purpose, use, and review of procedures. Section 7.1 states: “Procedures should be organized and presented for convenient use by operators. They should be free of extraneous material.” In the context of the July 15 infraction, it could be interpreted that any information in the table that was not directly required for the specific operation was “extraneous material.” Also, this information may not have been organized for convenient use by the material handler. DOE-STD-1029-92, *Writer’s Guide for Technical Procedures,* provides guidance for preparing procedures used at DOE facilities. The

standard states: "In addition, procedures must be technically and operationally accurate, up-to-date, and easy to follow, or workers will lack confidence in them and may not use them." DOE O 420.1, *Facility Safety,* provides direction on establishing criticality safety program requirements. Section 4.3, "Nuclear Criticality Safety," invokes the requirements of several ANSI/ANS standards, including those contained in ANSI/ANS-8.19-1984.

KEYWORDS: criticality safety, glovebox, procedures, postings

FUNCTIONAL AREAS: Nuclear/Criticality Safety, Procedures, Work Planning

2. CHEMICAL REACTION RUPTURES DRUMS

On July 29, 1997, at Pacific Northwest National Laboratory, two 55-gallon drums of phosphoric acid ruptured, spilling acid onto the floor of a storage cell area. Packaging personnel had repackaged the acid into metal drums earlier in the day and placed them in an assigned storage cell. The drums overpressurized, ruptured, and spilled approximately 100 gallons of acid. Waste management personnel determined that workers mixed incompatible materials (phosphoric acid and metal), resulting in a chemical reaction. The National Institute for Occupational Safety and Health's, *Pocket Guide to Chemical Hazards*, states that phosphoric acid readily reacts with metal to form hydrogen gas. Incorrect mixing of chemicals can cause fires and explosions or generate toxic gas. Pressurized drums present several personnel hazards, including (1) injury from an expelled drum lid or fragments of the burst drum; (2) exposure to radioactive or hazardous contents of the drum; or (3) exposure to pyrophoric materials, which can ignite and burn. (ORPS Report RL--PNNL-PNNLBOPER-1997-0022)

A packager was working in the facility when he heard a noise coming from the storage cell, opened the door to investigate, and discovered the acid spill. He then opened a high-bay door to provide ventilation, tested the spill with litmus paper to confirm that it was acid, and notified emergency response personnel. Waste management personnel determined the acid collected in sumps used for spill control. Decontamination personnel absorbed the acid on the floor and in the sumps with vermiculite. They safety repackaged the acid in accordance with the facility contingency plan.

Waste management personnel tested several steel drums and confirmed that they reacted with phosphoric acid. They also determined that after 5 hours the pressure in the drums was approximately 160 pounds per square inch. Facility managers stated that before the event they believed the drums were safe for storing the acid because they are approved Department of Transportation (DOT) containers. Facility personnel also stated that DOT regulations, material safety data sheets, and chemical handbook data were inconclusive regarding chemical compatibility of the acid and drums. However, 49 CFR 173.24, *General Requirement for Packagings and Packages*, section e, states: "it is the responsibility of the person offering a hazardous material for transportation to ensure that such packagings are compatible with their lading. This particularly applies to corrosivity, permeability, softening, premature aging, and embrittlement. Packaging materials and contents must be such that there will be no significant chemical or galvanic reaction between the materials and contents of the package."

Facility managers are preparing a lessons learned document for this event. In addition, facility personnel will receive training on chemical compatibility and procedures will be revised to ensure corrosivity issues are addressed.

NFS reported incompatible chemical mixing and storing events in Weekly Summaries 97-30 and 97-22. The Oak Ridge Y-12 Site reported a similar event to the Occurrence Reporting and Processing System (ORPS) database on July 31, 1997. NFS also reported numerous

pressurized drum events in the past year.

- On July 30, 1997, at the Oak Ridge Y-12 Site, an operator was removing the lid from an 8-gallon container when the lid blew off and struck her in the mouth. The container held methyl-ethyl-ketone sludge waste, which is known to produce hydrogen gas. The container did not show any signs of pressurization until the operator began loosening the lid. Investigation of this event is ongoing. (ORPS Report ORO—LMES-Y12WASTE-1997-0005)

- On July 17, 1997, at the Oak Ridge Y-12 Site, a sealed, plastic-lined, 55-gallon drum, containing organic waste materials from the cleanup of a nitric acid spill, overpressurized and blew the lid off the drum sometime between the evening of June 2 and the morning of June 3, 1997. The force of the venting caused the lid to strike and bend an overhead fire protection system pipe and dislodge the pipe hangers. (ORPS Report ORO--LMES-Y12WASTE-1997-0004)

- On May 22, 1997, at the Fernald Environmental Management Project, a waste shipping container overpressurized, ruptured, and was damaged by heat generated from an unexpected chemical reaction between uranium, water, and magnesium. (ORPS Report OH-FN-FDF-FEMP-1997-0034)

Operating Experience Analysis and Feedback (OEAF) engineers screened the ORPS database for events involving incompatible chemical mixing and pressurization of drums and found 123 occurrences DOE-wide since 1992. Figure 2-1 shows the distribution of root causes reported by facility managers for these events. Thirty-eight percent of the root causes were management problems, and 41 percent of these problems were attributed to inadequate administrative control. This is an indicator that facility personnel across the DOE complex are not incorporating lessons learned from past events into procedures for handling hazardous chemicals.

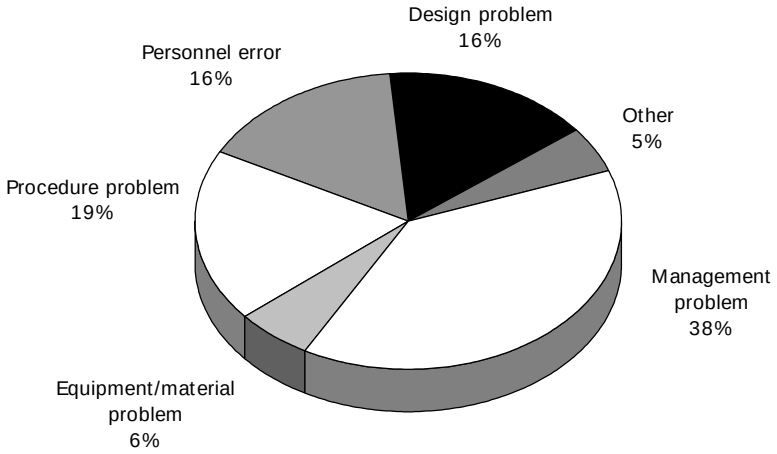

Figure 2-1. Distribution DOE-wide of Root Causes for Incompatible Chemicals and Pressurized Drum Events[1]

This event highlights the need for managers of facilities that generate, receive, and ship

[1] OEAF engineers reviewed the ORPS database for reports using all narrative “incompatible AND chemical@” OR “pressur@ AND drum@ AND (deform@ OR bulge@ OR lid)” and found 123 events reported in 109 reports from 1992 to present.

chemicals to develop appropriate programs and procedures to identify chemical compatibility. These programs should consider safe handling, storage, and transportation requirements. Facility managers should ensure that workers are familiar with facility safety precautions and emergency procedures and should provide workers with the necessary information to ensure accurate and complete compatibility evaluations. Hazardous chemicals must be identified and their risks understood. Risks should be evaluated, and barriers should be put in place to reduce them. Facility managers should emphasize the importance of researching all available sources of chemical safety information, particularly when performing first-time or infrequent operations. Information about chemicals, chemical hazards, and chemical safety programs can be located on the DOE Office of Environment, Safety and Health, Office of Worker Safety, Chemical Safety Program Home Page. The home page is located at URL http://tis-hq.eh.doe.gov/web/chem_safety/. This homepage provides links to many sources of information, including requirements and guidelines, lessons learned, chemical safety networking, and chemical safety tools. In facilities where hazardous chemicals are received, workers should be trained in handling chemicals and potential reactions. Personal protective equipment must be selected in accordance with the magnitude of the hazard, and training must be provided in the proper use of the equipment.

These events also highlight the need for comprehensive lessons learned programs. Incompatible chemical mixing and overpressurization of containers have been reported many times throughout the DOE complex. One objective of investigating and reporting the cause of occurrences is to identify corrective actions to prevent recurrence and thereby protect the health and safety of the public, workers, and environment. DOE M 232.1-1, *Occurrence Reporting and Processing of Operations Information*, requires trending and analysis of occurrence information for early identification and correction of deteriorating conditions. The manual also requires dissemination of operations information, including lessons learned.

DOE-STD-1010-92, *Guide to Good Practices for Incorporating Operating Experiences*, states: “The use of experience gained should provide a positive method that a facility can use to improve their operations, making them efficient, cost-effective, and safe to the employees, the public, and the environment.” Managers, supervisors, and operators should take advantage of available operating experience information and incorporate it as the standard suggests.

Lessons learned are valuable only if the information they communicate is used. DOE-STD-7501-95, *Development of DOE Lessons Learned Programs*, was designed to promote consistency and compatibility across programs. Both lessons learned and program managers should review the standard and incorporate applicable elements into their site programs. Managers, supervisors, and operators should review lessons learned documents for applicability, and the information should be used to improve operations.

In June 1997, NFS issued DOE/EH-0557, Safety Notice 97-01, "Mixing and Storing Incompatible Chemicals." The notice contains lessons learned related to the mixing and storing of incompatible chemicals. It also references a list of chemical incompatibilities provided by the University of Michigan. A copy of the chemical incompatibility list is available on the Internet at URL http://www.orcbs.msu.edu/chemical/chp/appendixc.html. Safety Notice 97-01 can be obtained by contacting the Info Center, (301) 903-0449, or by writing to ES&H Information Center, U.S. Department of Energy, EH-72/Suite 100, CXXI/3, Germantown, MD 20874. Safety Notices are also available on the Operating Experience Analysis and Feedback Home Page at http://tis.eh.doe.gov:80/web/oeaf/lessons_learned/ ons/ons.html.

The Office of Environment, Safety and Health provided information about the hazards associated with mixing of incompatible chemicals in DOE/EH-0296, Bulletin 93-2, "Mixing of Incompatible Chemicals," February 1993. The Office of Defense Programs also published two Safety Information Letters, SIL 96-05, *Compatibility Considerations in the Mixing of Waste Chemicals,* November 1996, and SIL 96-01, *Incidents from Chemical Reactions due to Lack of or Failure to*

Follow Proper Handling Procedures, June 1996, that address these issues and provide guidance to prevent similar incidents.

KEYWORDS: pressurized drum, chemical reaction, chemical spill

FUNCTIONAL AREAS: Chemistry, Industrial Safety, Materials Handling and Storage

3. WATER INTRUSION SHORT CIRCUITS 13.2-KV SYSTEM AT LOS ALAMOS NATIONAL LABORATORY

On July 27, 1997, at the Los Alamos National Laboratory, water backed up in an abandoned drain line and leaked into a 13.2-kV transfer switch at the Health Research Laboratory, causing the incoming circuit breaker in the transfer switch to short circuit and trip. The loss of power to the transfer switch caused a loss of power throughout the facility and a financial impact in excess of $40,000. The Plutonium Processing and Chemistry and Metallurgy Research facilities also lost power and ventilation. The loss of ventilation at the Plutonium Processing facility caused radioactive contamination to migrate from open-front containment boxes and activated continuous air monitor alarms. Investigators determined that the drain line was capped with duct tape. This event is significant because the drain line was not adequately capped when it was abandoned in place, resulting in equipment damage, loss of electrical power, and shutdown of ventilation systems required for contamination control. (ORPS Reports ALO-LA-LANL-HRL-1997-0001, ALO-LA-LANL-TA55-1997-0032, and ALO-LA-LANL-CMR-1997-0010)

Approximately 15 years ago, remodeling of several laboratories within the Health Research Laboratory required disconnecting and capping floor drains from a main drain line. When workers capped the drains, they used duct tape to cap piping connections. The taped connection worked for 15 years because the disconnected branch tapped into the top of a horizontal stretch of the main drain-line piping, and facility personnel did not know there was a problem until July 27, 1997.

When the incoming breaker tripped, an 8 percent voltage dip occurred across the Los Alamos power grid, tripping upstream breakers. This caused a loss of power at the Los Alamos radio tower for approximately 28 minutes. When the radio tower lost power, communication between the radio tower and the facility system control and data acquisition system was also lost. The system control and data acquisition system provides facility monitoring and communication using an automated call-out system. When trouble exists with class B equipment at the facility, the call-out system commences a pre-determined call-out sequence to notify appropriate personnel. Because the power transient affected several other facilities, the call-out system overloaded, and some personnel were not notified for up to 6 hours after the event.

Investigators determined that the main drain-line header continued to be fed by the remaining floor drains in the facility. An obstruction formed in the main drain line that caused water to back up in the drain line and flow up through the terminated pipe connection and out the taped end. When the water dripped into a vent leading into the transfer switch cabinet, it caused the incoming circuit breaker in the cabinet to short and trip. This resulted in irreparable damage to the breaker. The facility lost all incoming power because the transfer switch was not automatic and did not transfer to the secondary 13.2-kV input breaker. The building manager entered the sub-basement and discovered the dripping water and the burned circuit breaker in the transfer switch cabinet. Utilities personnel manually realigned the transfer switch to the secondary input breaker and restored power to the building.

A similar event involving improper capping of an unused pipe occurred on May 30, 1997, at Los Alamos National Laboratory. A Facilities Management employee discovered a penetration covered with tape that went through the wall of the Plutonium Processing facility to the outside.

The employee was conducting a containment-integrity walk-down to identify penetrations whose failure could create a direct path for radioactive material from the facility to atmosphere. Investigators determined that the penetration was an original design penetration that was never completed. They also determined that an unused pipe passed through the wall penetration and created a 3/8-inch gap on the exterior wall. (ORPS Report ALO-LA-LANL-TA55-1997-0024)

Water intrusion into electrical equipment can result in equipment damage, electrical outage, and disruption of facility operations. NFS reported other water intrusion events in Weekly Summaries 97-25, 96-39, 96-24, and 95-36.

- Weekly Summary 96-24 reported that on June 6, 1996, at Oak Ridge, a 13.8-kV circuit breaker in a substation tripped because 35 gallons of water accumulated in the primary bus compartment of a transformer resulting in a ground fault. Damage to the transformer was minimal; however, power was lost to the High Flux Isotope Reactor, the Radiochemical Engineering Development Center, and ancillary trailers. The power outage caused a reactor scram and evacuation of the Radiochemical Engineering Development Center. (ORO--ORNL-X10PLEQUIP-1996-0007)

- Weekly Summary 95-36 reported that on September 1, 1995, at the Rocky Flats Environmental Technology Site, a rainwater intrusion resulted in an unreviewed safety question for an emergency diesel generator. (RFO--KHLL-SOLIDWST-1995-0025)

- On August 8, 1991, the reactor at a commercial nuclear power station shut down when water entered a junction box for a main steam isolation valve. The water entered the building through a defective rain gutter. (Nuclear Regulatory Commission Licensee Event Report 91-017-01)

This event illustrates the importance of ensuring that abandoned systems are left in a condition that will prevent them affecting other systems or from becoming safety hazards to personnel. Facility managers should consider this when remodeling, modifying, or deactivating equipment or systems within the facility. Proper barriers should be used when permanently capping piping systems, especially if part of the pipe is connected to an in-service line. Duct tape may not provide the necessary long-term isolation and integrity. Work packages should identify acceptable methods for capping pipes, such as welded or threaded caps.

In past years, many facilities at DOE sites have ceased operations or have been abandoned. In many instances, this was done quickly and without significant hazard analysis for abandoned systems. OSHA 29 CFR 1926.850, paragraph (c), states that all electric, gas, water, steam, sewer, and other service lines shall be capped, or otherwise controlled, before demolition work is started.

KEYWORDS: breaker, water, power outage, modification

FUNCTIONAL AREAS: Modifications

4. WORK CONTROL WEAKNESSES RESULT IN VENTILATION SYSTEM UPSET

On July 28, 1997, at the Los Alamos National Laboratory, mechanics caused a positive ventilation (inversion) condition in a wing of the Chemistry and Metallurgy Research facility while performing preventive maintenance on a compressed air system dryer. The compressed air system provides control air for exhaust damper-opening mechanisms. The mechanics incorrectly positioned valves associated with the air dryer, allowing air to bleed from the opening mechanisms and causing the dampers to close. Personnel immediately evacuated the affected wing, and

radiological control technicians verified there was no spread of radioactive material. Investigators determined that weaknesses in the work control process allowed the mechanics to work on the system without adequate knowledge and without facility management approval. Maintaining a negative differential pressure between areas of the facility is an important engineered control to prevent the spread of contamination. (ORPS Report ALO-LA-LANL-CMR-1997-0009)

An engineering team leader in the facility operations center heard an evacuation announcement and saw indications of an exhaust ventilation system failure. He instructed an engineering technician to go to the attic of the wing and turn off the supply fans. The team leader and a radiological control technician entered the wing wearing personnel protective equipment and respirators. They found the exhaust fans running, but the exhaust dampers were closed. The engineering technician arrived in the attic wearing appropriate personnel protective equipment and stopped the supply fans. He told the team leader that subcontractor mechanics were in the attic working on the air dryer. The team leader deduced that the mechanics must have incorrectly positioned valves for the air dryer, allowing the exhaust dampers to close. He instructed the engineering technician to check the valve line-up and reposition valves as necessary to re-open the dampers. The technician found mispositioned valves and repositioned them, allowing the exhaust dampers to re-open. He then restarted the supply fans and restored the ventilation system to normal.

The facility manager convened a critique to gather information and determine the cause of the event. Critique members determined that the mechanics were attempting to perform what they believed was scheduled maintenance on the air dryer at 0600. However, because the maintenance work did not appear on any facility work schedules, operations personnel were not aware that the subcontractor intended to perform preventive maintenance on the air dryer. They also determined that the work package was not adequate and a lockout/tagout was not used on the air system that operates between 80 psig and 100 psig. The mechanics lacked training on the air system and its configuration and were not familiar with the work process. The mechanics also were not aware the wing had been evacuated while they worked in the attic and that they should have evacuated as well.

The engineering team leader informed subcontractor supervisory personnel not to begin any work in the facility until facility operations personnel arrive. He also told them that all work must be approved by operations personnel before the work begins. The team leader also stated that the work control procedures would be reviewed and modified as necessary to prevent this problem from recurring. The facility manager stopped all maintenance work pending a review of existing work packages to ensure they adequately address lockout/tagout requirements and identify work-related hazards.

NFS reported work performed without authorization or proper work controls in Weekly Summaries 97-27, 97-23, 97-22, 96-47 and 96-29.

- Weekly Summary 96-47 reported that on November 13, 1996, at the Hanford Analytical Laboratory, a subcontractor diesel mechanic removed a run-hour meter from an operating diesel, causing the diesel and a diesel-operated exhaust fan to stop. The mechanic performed the work without authorization or an approved work package. (ORPS Report RL--PHMC-ANALLAB-1996-0004)

- Weekly Summary 96-29 reported that on July 10, 1996, at the Rocky Flats Environmental Technical Site, a contractor engineer and an off-site vendor performed adjustments to a supply fan controller without a work control package or procedures and without the knowledge of building managers. (ORPS Report RFO--KHLL-SOLIDWST-1996-0095)

Facility managers should ensure that all personnel are made aware of the need for stringent work

controls. They should also ensure that work controls and work approval are conducted by personnel qualified and trained for the specific discipline involved. Preventive maintenance procedures or work packages should identify all isolation boundaries and lockout/tagout requirements. They should also provide instructions for equipment removal and restoration, as well as precautions regarding the potential affect on other equipment or systems. Facility managers should ensure that maintenance activities are identified on work schedules or in the facility plan-of-the-day. Plan-of-the-day meetings or pre-job briefings should be performed so that work organization responsibilities are clearly defined and the expectations of the task are understood.

DOE 4330.4B, *Maintenance Management Program*, section 8.3.1, provides guidelines on work control systems and procedures. The Order states that work control procedures help personnel understand the necessary requirements and controls. Section 3.4 identifies the elements of a maintenance management program that ensure planning, control, and documentation of maintenance. Work control managers at DOE facilities should review their programs to ensure that engineers and craftsmen understand their responsibilities and obligations. DOE-STD-1050-93, *Guideline to Good Practices for Planning, Scheduling, and Coordination of Maintenance at DOE Nuclear Facilities*, provides information on work controls and work coordination. DOE-STD-7501-95*, Development of DOE Lessons Learned Programs*, defines basic elements and concepts for site lessons learned programs. All managers should incorporate both site-specific lessons learned and those gained through DOE-wide operating experiences into their work process and work control procedures.

KEYWORDS: work control, ventilation, compressed air, preventive maintenance

FUNCTIONAL AREAS: Mechanical Maintenance, Work Planning

5. NUCLEAR CRITICALITY SAFETY VIOLATIONS AT FERNALD

On August 1, 1997, at the Fernald Environmental Management Project, nuclear materials disposition personnel reported that four uranium-235 ingots were located in an area not posted for the storage of enriched restricted materials, violating nuclear criticality safety procedures. Department of Energy (DOE) representatives also determined that the database used to track special nuclear materials had never been updated and did not correctly identify the location of the ingots. The representatives concluded that these errors constituted a loss of control of special nuclear material. As a result of a July 1 violation, DOE enforced a site-wide restriction on the movement and handling of enriched restricted materials. (ORPS Report OH-FN-FDF-FEMP-1997-0041)

While preparing shipments of depleted uranium metal, nuclear materials disposition personnel removed a tarp from some pallets and found the four ingots. Investigators determined that the ingots were initially stored in a posted fissile material control area. In April 1997, nuclear materials disposition personnel moved eight derbies and six ingots to another area in preparation for shipment; however, only two ingots were required to be shipped. They returned the eight derbies to the fissile material control area, but covered the remaining four ingots with a tarp and left them in the unposted area. On April 24, 1997, funding for the project ran out, and the personnel were re-assigned to other areas.

Investigators determined that the ingots were never moved from the unposted area and that an incorrect special nuclear material tracking database contributed to this violation. They also determined that procedures allowed special nuclear material to be moved within the same building without any authorizations and without updating the database. Facility personnel continue to review this event. They have not established final corrective actions or determined the root cause.

NFS reported similar criticality safety issues at Fernald in Weekly Summaries 97-28, 97-07, and 97-06.

- On July 1, 1997, waste management personnel violated two nuclear criticality safety controls. The first violation occurred when they moved five drums and two containers of enriched restricted material without documented approval for the operation. The second violation occurred because the supervisor assigned to the project was not trained as a fissionable material handler supervisor. Investigators determined that these violations constituted being outside of the facility authorization basis. DOE suspended nuclear material activities and required an operational readiness review before restarting operations. (ORPS Report OH-FN-FDF-FEMP-1997-0038)

- On January 31, 1997, fissile material handlers violated plant procedures when they moved a drum containing enriched restricted material from one facility to another without approval. Investigators determined that the drum was one of several containing enriched restricted material moved to a repackaging facility. (ORPS Report OH-FN-FDF-FEMP-1997-0013)

- On January 16, 1997, a Fernald facility manager reported that the nuclear material mass limit was violated in a storage building categorized as non-nuclear. Workers moved slightly enriched uranium into the storage building because managers at the building did not know the storage limits specified in DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*. (ORPS Report OH-FN-FDF-FEMP-1997-0006)

These events emphasize the importance of taking timely and effective corrective actions to prevent recurrence. DOE contractors who operate nuclear facilities and fail to implement corrective actions for identified deficiencies could be subjected to Price-Anderson civil penalties under the work processes and quality improvement provisions of 10 CFR 830.120, “Quality Assurance Requirements.” These actions include Notices of Violation and, where appropriate, non-reimbursable civil penalties. The primary consideration for determining whether DOE takes enforcement action is the actual or potential safety significance of the violation, coupled with how quickly the contractor acts to identify and correct problems. DOE STD-7501-95, *Development of DOE Lessons Learned Programs*, discusses management’s responsibility for incorporating appropriate corrective actions in a timely manner.

KEYWORDS: uranium, criticality safety, lessons learned

FUNCTIONAL AREAS: Materials Handling/Storage, Nuclear/Criticality Safety, Price-Anderson